Cognitive Orientations of Ultramarathoners[1]

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Abstract:
The purpose of this study was to examine the sport-specific cognitions of 112 ultramarathoners competing in a 100-mile trail run. Subjects completed the Sport Orientation Questionnaire, the Trait Sport-Confidence Inventory, the Commitment to Running Scale, and a questionnaire designed by the investigators to assess goals, cognitive strategies, perceptions of "runner's high," and feelings that occur when subjects are unable to run. Ultramarathoners were more confident, more committed to running, slightly higher in competitiveness, lower on win orientation, and higher on goal orientation in comparison to other athletes. Ultramarathoners also rated importance of and commitment to time goals very high; importance of and commitment to place goals were rated low. No significant differences in cognitive orientations were found between finishers and nonfinishers or between males and females. Responses to open-ended questions revealed that most ultramarathoners reported predominately external thoughts during races, had feelings of psychological well-being and strength as a result of ultramarathoning, never or rarely experienced runner's high, and experienced negative psychological states when unable to run. Overall, these results demonstrate the unique sport- specific cognitive orientations of ultramarathoners.

Article:
The relationship between cognition and athletic performance has long been of interest to athletes and coaches. Several investigators (Gould, Weiss, & Weinberg, 1981; Highlen & Bennett, 1979; Mahoney & Avener, 1977; Meyers, Cooke, Cullen, & Liles, 1979) have examined the cognitive strategies and patterns typically employed by athletes. Although these studies were exploratory and considered only a limited number of variables, as noted by Heyman (1982), cautious conclusions and recommendations have added to an understanding of cognition and athletic performance and have increased the possibilities for intervention strategies.

Successful gymnasts (Mahoney & Avener, 1977), wrestlers (Gould et al., 1981; Highlen & Bennett, 1979), and racquetball players (Meyers et al., 1979) have demonstrated greater self-confidence, less anxiety, and greater ability to focus attention than their less successful counterparts. In the present study, we were interested in investigating the cognitive orientations of a unique group of athletes, ultramarathoners (competitors in footraces beyond the conventional marathon distance of 26.2 miles).

McCutcheon and Yoakum (1983) have attempted to find differences among ultramarathoners, runners, and nonrunners using the Self-Motivation Inventory (Dishman & Ickes, 1981) and Wrightman's (1974) Philosophies of Human Nature Scale. Finding no significant differences, these researchers suggested that employing other measures may be helpful in determining unique characteristics of ultramarathoners. Tharion, Strowman, and Rauch (1988) have examined the changes in pre- and postrun affect of ultramarathoners. Using the Profile of Mood States, they demonstrated no significant pre- to postrun differences in tension, depression, anger, confusion, and vigor between finishers and nonfinishers of an ultramarathon. Fatigue was found to differ and was attributed to the finishers' running further. Morgan and Pollock (1977) have been successful in differentiating elite marathoners from nonelite marathoners on the basis of cognitive strategies. Elite marathoners reported

using associative (attending to an individual's physical sensations) rather than dissociative strategies (attending to distracting thoughts or images) during races; nonelite marathoners reported using dissociative strategies.

The purpose of this study was to examine the cognitive orientations of ultramarathoners competing in a 100-mile trail run. We assessed the responses of ultramarathoners to construct of confidence, competitive orientation, and commitment to running. As already mentioned, sport-confidence has differentiated successful from unsuccessful athletes (Gould et al., 1981; Highlen & Bennett, 1979; Mahoney & Avener, 1977; Meyers et al., 1979). Gill and Deeter (1988) have demonstrated differences between participants of competitive activity and nonparticipants and between men and women in sport-achievement orientation. Males have a greater desire to enter and strive for success in sport competition and are more oriented toward win/loss outcomes than women. In comparison, women are more oriented toward personal goals. Finally, Carmack and Martens (1979) have revealed differences between faster and slower runners in their commitment to running. To further understand the cognitive orientations of ultramarathoners, we examined goals, psychological techniques used to enhance performance, "runner's high," and feelings that occur when one is unable to run.

Furthermore, we examined whether any of the cognitive orientations could differentiate finishers from nonfinishers, differentiate men from women, or predict finishing times. We predicted that ultramarathoners would exhibit psychological characteristics similar to other athletes. Finishers would report higher self-confidence scores and have a higher commitment to running than nonfinishers. Female ultramarathoners would be oriented more toward personal goals and be lower on commitment to running; male ultramarathoners would be more oriented toward win/loss outcomes and be higher on commitment to running.

Method
Sample
The subjects were entrants in either the Western States 100-Mile Endurance Run or the Leadville Trail 100 ultramarathon. The Western States 100-Mile race starts in Squaw Valley, California, and proceeds through the Sierra Nevada mountains. This race is often described as the world's ultimate test of endurance. Its challenges include a total ascent of 19,000 ft, a total descent of 21,000 ft, high altitude, and extremes in air temperature (30 °F to 110 °F). The Leadville Trail 100 ultramarathon begins in Leadville, Colorado. Elevation ranges from its lowest point of 9,200 ft to its highest point of 12,600 ft. Ultramarathoners have described the experience of running the Leadville Trail as "running 100 miles with a sock in your mouth." The data from these two samples were collected by different methods.

The subjects participating in the Western States 100-Mile race were mailed the questionnaire. To represent the total sample of entrants, the men were grouped by age, and a stratified random sample of 50 male ultramarathoners were sent the questionnaire. All 50 women entered in the race were sent the questionnaire. Included with the questionnaire was a statement assuring the runners that their responses would remain confidential and notifying them that participants in the study would receive a summary of the results. The questionnaire was mailed one week before the race, and 47 ultramarathoners (24 men and 23 women) returned the questionnaire before the start of the race.

Ultramarathoners competing in the Leadville Trail 100 (approximately 255 entrants) were asked by an experimenter to complete the questionnaire at an organizational meeting the night before the start of the race. The completed questionnaire was returned by 65 ultramarathoners (62 men and 3 women).

Instrumentation
The Sport Orientation Questionnaire (SOQ; Gill & Deeter, 1988) was employed to assess achievement orientations. The 25 items on this inventory are rated on a 5-point scale ranging from *strongly disagree* to *strongly agree.* This scale assesses three constructs: (a) competitiveness, reflecting one's desire to compete and to be successful in sport (13 items), (b) win orientation, reflecting one's desire to win or avoid losing (6 items), and (c) goal orientation, reflecting one's desire to achieve personal performance standards (6 items). Gill and

Deeter have presented psychometric evidence to support the reliability (alpha coefficients of .79 to .95; test-retest of r=.73 to .89) and construct validity of this measure.

The Trait Sport-Confidence Inventory (TSCI) is a dispositional construct defined as the belief or degree of certainty an individual possesses about his or her ability to be successful in sport (Vealey, 1986). The 13 items in the inventory are rated on a 9-point scale ranging from *low* to *high.* Vealey (1986) has rcported internal consistency as measured by Cronbach's alpha coefficient of .93 and a test-retest reliability of r=.86 and has demonstrated concurrent and construct validity.

The final inventory used was the Commitment to Running Scale (CR; Carmack & Martens, 1979). This 12-item inventory was used to assess the ultramarathoners' commitment to running. The CR rates responses on a 5-point scale from *strongly agree* to *strongly disagree.* The scale's substantial psychometric support is represented by a Kuder-Richardson reliability coefficient of .97; concurrent validity has been presented by Carmack and Martens (1979).

For this study, we developed a questionnaire that included items assessing information on demographics, running experience, and competition goals. Each subject was asked to state a personal goal for placing within his or her sex and age group (i.e., first, second, third). The subject was then asked to rate how important this goal was and how committed he or she was to it on a 040-10 scale, with 0 being *not important* and 10 being *very important.* Along with place goals, runners were asked to state personal goals for performance time, to rate the importance, and to state their commitment to the goals.

To investigate cognitions during racing, we asked subjects a forced-choice question on whether their thoughts while running are mainly externally focused (i.e., musical melodies, problems at work, math problems, sex) or mainly focused on internal sensations (breathing, leg sensations, muscle tension). A follow-up question asked them to list the thoughts they have while racing. Open-ended questions were used to investigate whether or not these athletes perceived themselves as addicted to running and their feelings in response to not being able to run. Runner's high was also addressed by asking them if they had experienced it, how often, and when and to provide a description. Finally, subjects responded to a series of questions that assessed cognitive strategies relevant to ultramarathoning.

Results

A discriminant function analysis comparing the two samples (the 47 Western States 100-Mile race competitors and the 65 ultramarathoners in the Leadville Trail 100) on the variables collected revealed no significant differences. Thus the samples were combined for all analyses. Descriptive analyses were conducted to present a psychological profile of these ultramarathoners. Discriminant analyses were used to examine differences between finishers and nonfinishers and between males and females. To examine the relationships among psychological variables and performance, regression analyses were used. Finally, open-ended responses were categorized by raters to see if any patterns emerged.

Descriptive Information

The ultramarathoners in this study were 86 men and 26 women (n=112) who had a mean age of 40.2 years. These ultramarathoners had extensive experience in terms of years of running (M=9.7, SD=5.1) and number of ultramarathons attempted (M=14.9, *SD=16.3).* Ultramarathons can be demanding, and many factors over the course of the race can negatively affect performance, often preventing runners from finishing the race. The past success of these subjects is reflected in the number of ultramarathons completed (M=13.5, *SD=15.6)* relative to the number of ultramarathons attempted.

Table 1 presents the ultramarathoners' scores on the TSCI, the CR, and the three dimensions (competitiveness, win, goal) of the SOQ. Relative to the scores of other athletes, which have been reported by test developers, the ultramarathoners are quite confident and committed to running. They are slightly higher on competitiveness, lower on win orientation, and higher on goal orientation than

Table 1

Scores on Standard Inventories

Measures	Range of scores	Ultramarathoners M	SD	Other athletes M	SD
Sport Orientation Questionnaire					
Competitiveness	13–65	49.1	9.9	47.8	9.5
Win orientation	6–30	16.7	5.9	18.7	5.1
Goal orientation	6–30	27.1	3.1	25.4	3.8
Trait Sport-Confidence Inventory	13–117	90.0	14.6	82.3	17.9
Commitment to Running Scale	12–60	51.5	6.1	47.9	6.3

Note. Other athlete scores for SOQ, TSCI, and CR are taken from Gill and Deeter (1988), Vealey (1986), and Carmack and Martens (1979), respectively.

other athletes. This suggests that ultramarathoners are competitive and focus on attempting to achieve personal goals, with little concern for win/loss outcomes.

The ultramarathoners' ratings of their place and time goals underscore the emphasis on personal goals that was demonstrated in the SOQ results. Table 2 shows that these subjects rated importance of time goals highly and were very committed to time goals. In contrast, they rated the importance of and their commitment to place goals much lower, even though they were asked to consider place goals within age and sex categories. These ultramarathoners indicated relatively little concern for such social comparison or win/loss outcomes.

The responses to the questions asking what the runners think about during a race, whether or not they experience runner's high, and whether or not they are addicted to running are dichotomous and thus are presented as percentages in Table 2. These results demonstrated that a similar number of ultramarathoners described their thoughts as internal or external, did or did not experience runner's high, and thought they were or were not addicted to running.

Cognitive Predictors of Success

The finishers' and nonfinishers' scores for previously mentioned questions and inventories were compared using a discriminant function analysis. The overall multivariate comparison of the two groups was nonsignificant. Differences between males and females were also examined using discriminant function analysis. No significant differences were determined. These results should be treated with caution because of the uneven sample-size distributions for male and female subjects.

To determine if psychological variables predicted finishing time, a stepwise multiple regression analysis was performed using only the finishers' data. The regression indicated that finishing time was significantly predicted by the finishers' time goal, $F_{(1,59)}=42.38$, $p<.05$; $R^2=.42$, followed by their rating of commitment to their place goal, which significantly increased the prediction,

Table 2

Ultramarathoners' Responses to Specific Items

Items	%	n	Range of scores	M	SD
Goal for placing					
Commitment			0–10	4.7	4.5
Importance			0–10	4.0	4.3
Goal for finishing time					
Commitment			0–10	8.0	2.7
Importance			0–10	7.4	2.9
Thoughts during a race					
External	50.4	57			
Internal	49.6	55			
Do you experience runners high?					
Yes	60.3	68			
No	39.7	44			
Do you think you are addicted to running?					
Yes	61.5	69			
No	38.5	43			

$F_{(2,58)} = 27.85$, $p < .05$; R^2 change $= .05$. This analysis demonstrates that ultramarathoners with slower finishing times had faster time goals and had higher ratings of commitment to place goals.

Open-Ended Questions
After reading the completed questionnaire, the investigators developed and agreed upon the categories for the ultramarathoners' responses to the open-ended questions (see Tables 3 and 4 for categories). Then two independent raters categorized the open-ended questions. The raters' initial agreement was very high (96%). Disagreements were resolved during a discussion with the primary investigator. Tables 3 and 4 present the ultramarathoners' responses to the open-ended questions.

These ultramarathoners reported having thoughts during running related to music, friends, sexual fantasies, and sport fantasies. Additionally, runners thought about having a good time, making friends, imaginary conversations, planning a vacation, and admiring the beauty and adventure of the course and the event. Several runners reflected philosophically on "why do we do this," the meaning of suffering, "who am I," and love and hate. Two ultramarathoners had unique responses: "What a fantastic thing God has given me the privilege of doing for many, many miles. It's just God, the mountain, and me," and "Instead of a mantra, I say the rosary; it's easy to do with a catholic background. It always gets me through."

Cognitive strategies used in training and racing included examples of visualization, reading prerace paraphernalia, setting goals, self-talk, and thought control.

Table 3

Responses to Open-Ended Questions on Psychological Techniques

Techniques	%	n
Used before race begins		
Cognitive or attention control	42.0	47
Goal-setting strategies	15.2	17
Visualization	31.3	35
Anxiety management	12.5	14
Others	12.5	14
None	47.3	53
Used during racing		
Cognitive or attention control	53.6	60
Goal-setting strategies	24.1	27
Visualization	8.9	10
Anxiety management	11.6	13
Others	6.3	7
None	40.2	45

Table 4

Responses to Open-Ended Questions on Addiction and Runners' High

Responses	%	n
Feelings expressed when not able to run		
Positive psychological well-being	3.6	4
Positive physical state	.9	1
Negative psychological well-being	84.8	95
Negative physical state	33.0	37
Neither	21.4	24
Runners' high—frequency		
Always (weekly)	17.0	19
Sometimes (monthly)	17.0	19
Rarely (once per year)	8.9	10
Never	45.5	51
Not specified	33.0	37
Runners' high—state		
Positive feeling	25.0	28
Flow	12.5	14
Dream state	6.3	7
Other/no description	36.6	41

Note. Flow includes feelings related to running (i.e., "I feel like I could run forever"). Dream state includes feeling as if you are outside of your body, watching yourself.

One runner taped up this quote in her room: "dream, prepare, endure, achieve." Another used prayer throughout the run, and one runner stated, "Just run, no gimmicks." Visualization techniques included "other runners dying" and "myself as a mountain man being chased by hostile Indians."

When asked about runner's high, 45.5% of the respondents claimed to have never experienced it. One subject wrote, "Not yet, I'm waiting (10 years of running experience)." In addition, runners described their "high" as a cheerful feeling, a sense of accomplishment, a feeling as if "outside myself," and as an exhilaration of being alive and moving. Other descriptions included feeling as if in a vacuum, oblivious, and even omnipotent. One individual offered a description of what most of the ultramarathoners seem to have been trying to express: "Not really, the term seems pretty vague to me; but if everything is working properly, I have runs that make me feel very, very exhilarated."

A small number of ultramarathoners expressed their neutral or somewhat positive affect when not running. For example, responses included "happy unless I'm injured," "relieved I can catch up on other things," "no problem, I find something else to do," and "it depends on why." However, most (84.8%) of these runners expressed feelings of despair, aging, frustration, anxiety, guilt, depression, or feeling trapped, fat, a decrease in self-worth, a decrease in self- confidence, or a need for the "cleansing of running." One woman wrote, "I cry every few hours—feel heartbroken like a death of a close friend, a black cloud over my head—gloomy feelings."

Additional comments from these ultramarathoners expressed the sense of adventure and excitement in undertaking the challenge of ultramarathoning. In addition, the necessity for mental toughness and strength, a never-give-up attitude, was emphasized. Also mentioned was the mental roller coaster of extreme emotional high and low points that often occur during an ultramarathon. One runner stated, "You can't know what's enough until you find out what's more than enough."

Discussion

Athletes who compete in ultramarathons present a unique population of sport participants. Few people have experienced what it takes to complete such a race. In an attempt to gain at least partial understanding, this study examined the sport- specific cognitive orientations of ultramarathoners. The findings suggest that ultramarathoners do display unique sport-specific characteristics and responses. Ultramarathoners as a group were middle-aged (40.2 years) and were more focused on personal standards and time goals than on winning or place goals. In addition, this sample was very confident and committed to running, as demonstrated by their high scores on the TSCI and the CR.

Morgan and Pollock (1977) first hypothesized that, similar to Tibetan monks who would run 300 miles at a time, elite marathoners use dissociative cognitive strategies while running. However, in their own research, this hypothesis was rejected. They found that elite marathoners use associative strategies. When our sample of ultramarathoners was asked a forced-choice question, a relatively equal number of respondents claimed to have external and internal thoughts. However, when ultramarathoners responded to the open-ended question about their thoughts during a race, most (75%) of these specific thoughts were categorized as external. These results seem to support what Morgan and Pollock had first hypothesized. This external focus may occur not only as a cognitive strategy to dissociate from discomfort but also, as many athletes mentioned, to enjoy the surrounding mountain views and watch for dangerous footing. This type of attentional focus may not be as enjoyable or necessary on the roads of a marathon.

Rauch, Tharion, Strowman, and Shukitt (1988) found mood differences (tension and fatigue) between finishers and nonfinishers of a 50-mile run. The present investigation attempted to look at additional sport-specific cognitions and found no differences between finishers and nonfinishers in ultramarathoners running 100 miles. The fact that finishers and nonfinishers did not differ on trait self-confidence is worthy of notice. Other researchers have found differences in the self-confidence of successful and unsuccessful wrestlers (Gould et al., 1981; Highlen & Bennett, 1979), gymnasts (Mahoney & Avener, 1977), and racquetball players (Meyers et al., 1979). The lack of a difference between finishers and nonfinishers in this study may be due to the use of a different measure of self- confidence. Also, these ultramarathoners, as a group, scored very high on the TSCI, suggesting a possible ceiling effect or a characteristic reflective of nltra- marathoners who enter 100-mile races. Additionally, the lack of differentiation between finishers and nonfinishers may have been due to the variables investigated; other psychological factors may differentiate finishers from nonfinishers. Finally, psychological factors are not the only factors that can affect performance; ultramarathoners are very demanding, and many factors can debilitate performance. Runners may suffer from hyperthermia, hypothermia, dehydration, acci- dental injury, over-use injuries, gastric distress due to food or fluid intake, sickness, and extreme fatigue.

The similarity in responses of male and female ultramarathoners contrasts with reports of gender differences in athletes. More specifically, Gill (1986) has reported that males score higher on competitiveness and are more oriented to win/ loss outcomes whereas women are more oriented toward personal goals. In addition, women

have been reported to score lower on the CR (Carmack & Martens, 1979). Our discrepant results may be due to the older age of our sample or, more likely, may reflect the unique characteristics and demands of ultramarathoning.

The regression equations demonstrated the relationship between time goals and finishing time and revealed the unexpected relationships between high commitment to and importance of place goals and slower finishing times. Possibly, those individuals who rate their place goals high on importance and commitment are focused on their position relative to others and may not be attending to hydration, fuel consumption, and racing strategies. Thus, by not attending to the factors that would ensure a fast finish, overall performance is hindered. However, a contradictory explanation would be that the athletes who did not focus on place goals are more experienced, familiar with the competition, familiar with their relative ability, and/or have previously finished a 100-mile race and thus are more focused on time goals.

Responses to the open-ended questions provide additional descriptive information that characterizes ultramarathoners. The thoughts ultramarathoners reported having while running were categorized as internal or external; however, an additional distinction was evident in that many thoughts were either existential (philosophical thoughts questioning the purpose of their running experience and lives) or spiritual (gathering strength and purpose from God).

Cognitive strategies used in training and racing included examples of visualization, reading prerace paraphernalia, setting goals, self-talk, and thought control. The psychological techniques used by these ultramarathoners are common to many athletes and in most cases can be described as cognitive strategies designed to control thought processes to more effectively cope with the challenge and discomfort of running ultramarathons.

Interestingly, 45.5% of the respondents claimed to have never experienced runner's high. In reviewing these responses, it is apparent that there may have been a problem with semantics; what one may call "high," another may call just a "good feeling." The question was put very simply, "Do you experience runner's high? If so, how often? Please describe." To further understand ultra- marathoners' experience of runner's high, a more specific question may need to be posed. Nonetheless, the descriptions these ultramarathoners provided clearly depicted enhanced positive affect while running.

The responses to the question addressing feelings that occur when one is unable to run provide insight into the importance these ultramarathoners place on running and their reasons for running. In summary, running seems to have a cleansing effect, to be self-fulfilling, and to mediate negative psychological states that can arise when not running.

The responses of these ultramarathoners to the open-ended questions bring to light the importance of their experiences as ultramarathoners. While running, these individuals experience moments of extreme emotion and unique perceptions that motivate them to continue running ultramarathons. Descriptions of experiences related to running 100 miles are similar to what Maslow (1962) has termed "peak experience." Maslow has described peak experience as an intense transient moment of self-actualization in which an individual suspends the restrictions of his or her culture and is closest to his or her real self. For many of these ultramarathoners, running can be a peak experience. Additionally, several ultramarathoners expressed existential or spiritual philosophical orientations during running.

The results of this study suggest that ultramarathoners are a unique group of athletes, not only because of the event but also because of their cognitive orientations. The motivation necessary to compete in and complete a 100-mile race seems to come from the desire to achieve personal goals. The sport-specific profile, the lack of differences between finishers and nonfinishers, and the lack of gender differences suggest that the cognitive orientations of elite athletes may differ from one sport to another. This suggestion has been previously pre-sented by Highlen and Bennett (1979) in relation to open and closed skills. Further investigation into activities

and sport-specific cognitive orientations may offer information necessary to better understand the psychological tools used by athletes in certain events. These findings would be useful to applied sport psychologists in attempting to individualize intervention techniques in specific sports.

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